



COVID-19

Science Brief: Evidence used to update the list of underlying medical conditions that increase a person's risk of severe illness from COVID-19

Updated May 12, 2021

[Print](#)

For more information, please see: [Underlying Medical Conditions Associated with High Risk for Severe COVID-19: Information for Healthcare Providers](#) and the [People with Certain Medical Conditions](#) webpage, which is intended for the general public.

Summary of Recent Changes

Updates as of May 13, 2021



Updates to the list of underlying medical conditions that put adults of any age at high risk for severe illness from the virus that causes COVID-19 were based on evidence from published reports, scientific articles in press, unreviewed pre-prints, and internal data. Updates to the following conditions were completed based on evidence from the date range below:

- Pregnancy related references were added in May 2021.
- Substance use disorders were based on evidence published between December 1, 2019, and January 2021.
- Asthma, blood disorders, cancer, cerebrovascular disease, chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), cystic fibrosis, diabetes, Down syndrome, heart disease, hypertension, immunosuppressant medications, use of corticosteroids or other immunosuppressive medications, solid organ or blood stem cell transplantation, neurological conditions, and obesity were based on evidence published between December 1, 2019, and December 2020.
- Smoking was based on evidence published between December 1, 2019, and July 20, 2020.
- All other conditions were based on evidence published between December 1, 2019, and October 16, 2020.

In keeping with an ever-growing volume of literature, references are now categorized by study type. With these categories, we can be more specific about the type of study used as supporting evidence. By presenting the references in these categories, clinicians can better evaluate the quality of the data to determine risk.

No conditions were removed from the previous underlying medical conditions list.

Context

There is much to learn about the newly emerged COVID-19. Based on available literature and data from CDC-led investigations, we continue to learn more about COVID-19 and associated underlying medical conditions that put adults at increased risk of severe illness. Severe illness from COVID-19 is defined here as hospitalization, admission to the intensive care unit (ICU), intubation or mechanical ventilation, or death. Evidence used to inform this list was determined by CDC reviewers based on available evidence about COVID-19 at time of review.

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Overview

Conditions on this list have been shown to be associated with severe illness from COVID-19. Updates to the conditions below were based on published reports, scientific articles in press, unreviewed pre-prints, and data from CDC-led investigations. Conditions were categorized by the type of study design:

- **Supported by meta-analysis/systematic review:** Defined as having a significant association in at least one meta-analysis or systematic review.
- **Supported by mostly cohort, case-control, or cross sectional studies:** Defined as having an association in cohort, case-control or cross sectional studies; may include systematic review or meta-analysis that represents one condition in a larger group of conditions (for example, kidney transplant under the category of solid organ or blood stem cell transplantation).
- **Supported by mostly case series, case reports or, if other study design, the sample size is small (and no systematic review or meta-analysis were available to review):** Defined as having an association in one or more case series studies. If there are cohort or case-control studies, sample sizes were small. Conditions included may be rare.
- **Supported by mixed evidence:** Defined as having an association in at least one meta-analysis or systematic review and additional studies or reviews that reached different conclusions about risk associated with a condition.

In keeping with an ever-growing volume of literature, references are now categorized by study type. With these categories, we can be more specific about the type of study used as supporting evidence. By presenting the references in these categories, clinicians can better evaluate the quality of the data to determine risk.

To learn more about the study designs used to determine the risk of severe COVID-19 outcomes in these research studies, providers can review the following:

[Principles of Epidemiology | Lesson 1 – Overview \(cdc.gov\)](#)

[Principles of Epidemiology | Lesson 1 – Section 7 \(cdc.gov\)](#)

[Rating Evidence in Medical Literature | Journal of Ethics | American Medical Association \(ama-assn.org\)](#) [↗](#)

This list might change and, upon review as the science evolves, CDC might update it.

Based on available evidence, conditions could move between evidence categories. Aside from substance use disorders and Down syndrome, last reviewed in January 2021 and December 2020, respectively, no additional condition has been added to this list. If strong and consistent evidence demonstrated no association with severe outcomes, it may be removed from the list. No conditions were removed from the previous underlying medical conditions list.

Table of Evidence

Evidence used to inform the list of underlying medical conditions that increase a person’s risk of severe illness from COVID-19. In alphabetic order by section.

Tier	Condition	Evidence of Impact on COVID-19 Severity [Reference number]
Supported by meta-analysis/systematic review	Cancer	Systematic Review [1, 2] Cohort Study [3-5] Case Series [6-8] Case Control Study [9]
	Cerebrovascular disease	Meta-Analysis [10-13] Synthesis of Evidence [14] Cohort Study [15-17]
	Chronic kidney disease	Meta-Analysis [13, 18] Cohort Studies [16, 19-40], {41}* Case Series [42-44]
	COPD	Meta-Analysis [45-47] Systematic Review [48, 49]

Tier	Condition	Evidence of Impact on COVID-19 Severity [Reference number]
	Diabetes mellitus, type 1	Meta-Analysis [50] Case Series [43] Cohort Study [15, 51-56]
	Diabetes mellitus, type 2	Meta-Analysis [57] Systematic Review {58}* Gestational Diabetes Systematic Review {59}* Case Series [43] Longitudinal Study [60] Cohort Study [50, 54, 60-65]
	Heart conditions (such as heart failure, coronary artery disease, or cardiomyopathies)	Meta-Analysis [66-68] Cohort Study [15, 16]
	Smoking, current and former	Meta-Analysis [45, 67, 69-76]
	Obesity	Systematic Review {58}* Cohort [24, 80-88], {41, 89-92}* Meta-Analysis [77-79]
	Pregnancy and Recent Pregnancy	Systematic Review [58, 93] Case Control [94, 95] Case Series [96-98] Cohort Study [99-102]
Supported by mostly cohort, case-control, or cross-sectional studies (if there is a systematic review or meta-analysis available, it represents one condition in a larger category of conditions)	Children with certain underlying conditions	Systematic Review [103, 104] Cross-Sectional Study [105-107] Cohort Study [108-116] Case Series [117, 118]
	Down syndrome	Cohort Study [119, 120]
	HIV	Cohort Study [32, 121-123] Case Series [124-126]
	Neurologic conditions	Review [127] Cross-Sectional Study [105] Cohort Study [16, 108]
	Overweight	Cohort Study [83] Case Series [88]
	Other lung disease (including interstitial lung disease, pulmonary fibrosis, pulmonary hypertension)	Cohort [128-130], {92}*
	Sickle cell disease	Cohort [117, 118, 131, 132] Case Series [117, 132-147]
	Solid organ or blood stem cell transplantation	Meta-Analysis [86] Case Series [148-159] Cohort [160]
	Substance use disorders	Case-Control Study [161-163] Cohort Study [164, 165]
	Use of corticosteroids or other immunosuppressive medications	Cohort Study [166] Cross Sectional [167] Case Series [168-170]
Supported by mostly case series, case reports or, if other study design, the sample size is small (and no systematic review or meta-analysis available were reviewed)	Cystic fibrosis	Case Series [171-173] Cohort [174]
	Thalassemia	Case Series [175-178] Cross Sectional [179]
Supported by mixed evidence	Asthma	Meta-Analysis [180-182] Review [183] Case Series [184] Cohort Study [16, 40, 185-190]
	Hypertension	Meta-Analysis [67, 191-194] Systematic Review [195], {58}* Cohort Study [15, 16, 19, 187, 196-202] Case Series [203]

Tier	Condition	Evidence of Impact on COVID-19 Severity [Reference number]
	Liver disease	Meta-Analysis [204-208] Cohort [19, 28, 42, 209-223] Case-Control [224-229] Cross sectional [230] Case Series [231-233]
	Immune deficiencies	Meta-Analysis [234] Cohort [235-237] Case Series [148, 149, 157, 238-241]

Footnote: { }* indicates pregnancy-related reference.

Literature cited above was provided and reviewed by CDC reviewers, categorized, and added to the table (if not already on the previous underlying medical conditions list [originally released in March 2020]). The following categories were used:

Supported by meta-analysis/systematic review: Defined as having a significant association in at least one meta-analysis or systematic review.

Supported by mostly cohort, case-control, or cross sectional studies (if there is a systematic review or meta-analysis available, it represents one condition in a larger group of conditions): Defined as having an association in cohort, case-control, or cross sectional studies; may include systematic review or meta-analysis that represents one condition in a larger group of conditions (for example, kidney transplant under the category of solid organ or blood stem cell transplantation).

Supported by mostly case series, case reports or, if other study design, the sample size is small (and no systematic review or meta-analysis were available to review): Defined as having an association in one or more case series studies. If there are cohort or case-control studies, sample sizes were small. Conditions included may be rare.

Supported by mixed evidence: Defined as having an association in at least one meta-analysis or systematic review and additional multiple studies or reviews that reached different conclusions about risk associated with a condition.

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